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E70 Head-Up Display Workbook

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Subject

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Head-Up Display

Model: E70

Production: From Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Demonstrate the functions of the Head-up Display on the E70.
- Identify the changes to the HUD in comparison with the previous system.

Head-up Display (HUD)

The very name "Head-up" describes the principle benefit of this system. The Head-up display (HUD) projects important information such as cruise control data or instructions from the navigation arrow are reflected onto a special glass windshield and are thus permanently in the driver's field of vision.

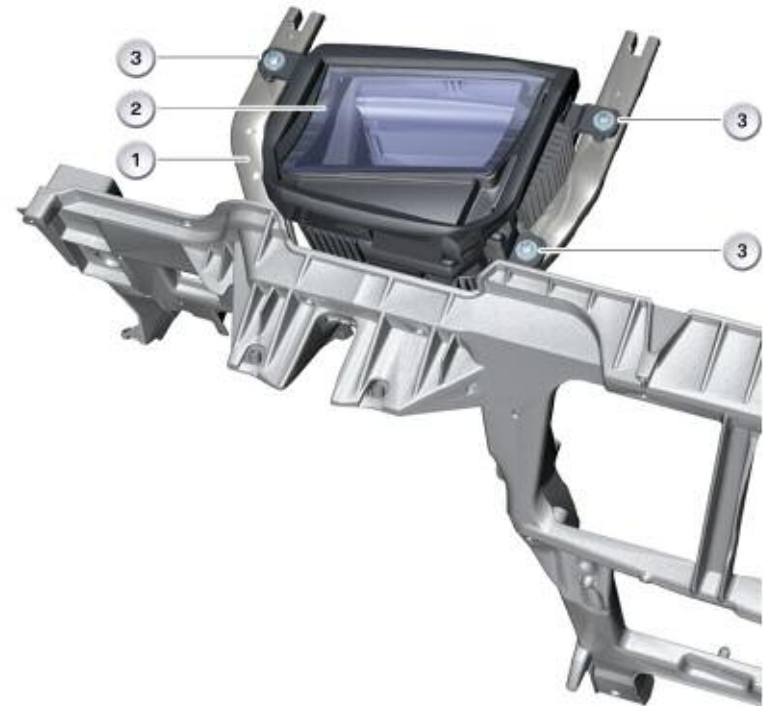
This include the display of:

- Cruise control DCC Data
- Navigation system information
- Check Control messages
- Vehicle speed.

This HUD system is similar to that of the 6 Series and 5 Series with enhanced features and service adjustment procedures.



The separate components of the head-up display are the cover glass, 2 mirrors, LED power supply, LED array, TFT projection display, PCB and casing. The head-up display can only be replaced as a complete unit. It is not possible to replace components or separate parts.



Index	Explanation	Index	Explanation
1	Carrier bracket	3	Hexagon bolts
2	Head-up display HUD		

A TFT (Thin Film Transistor) is a (silicon based) three layer semiconductor. The device is a millimeter thick and allows light to shine through a filter when an electrical current is applied. TFTs project precise colors when subjected to a potent light source and are the technology used on modern Thin Film Transistor Active Matrix Liquid Crystal Displays (TFTAMLCD).

An LED array acts as this light source. The image content is created by the (TFT) Thick Film Transistor projection display. The TFT projection display can be compared to a filter which admits or blocks light.

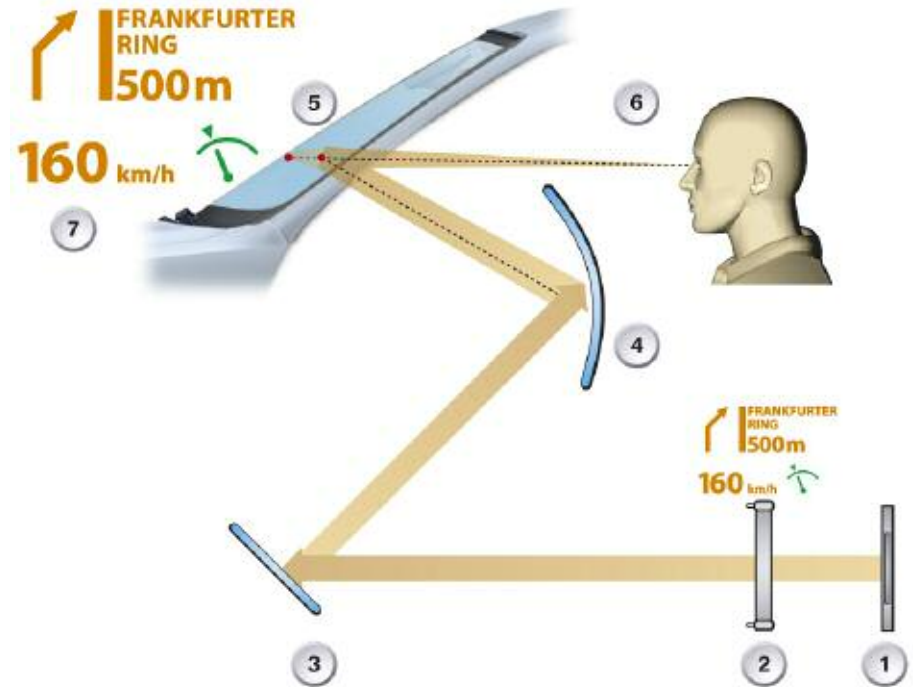
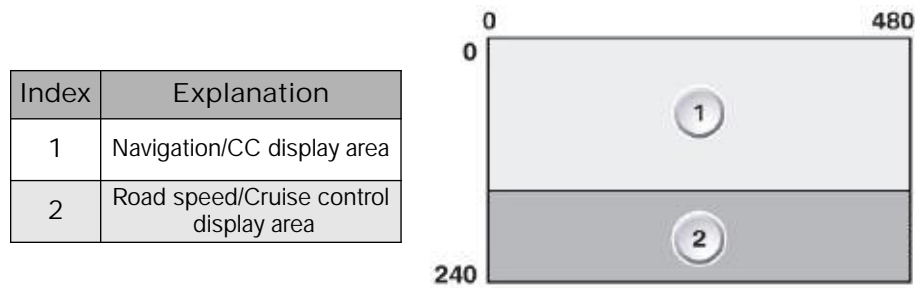
An optical imaging element determines the shape, distance and size of the HUD images. The image appears to float freely over the road, the windshield acts as a deflecting mirror.

Display Area

The HUD size is approximately 200 mm x 100 mm with a display resolution of 480 x 240 pixels. The HUD is separated into 2 display areas. The individual fields are "optically" separated in the image so that they can be identified more easily.

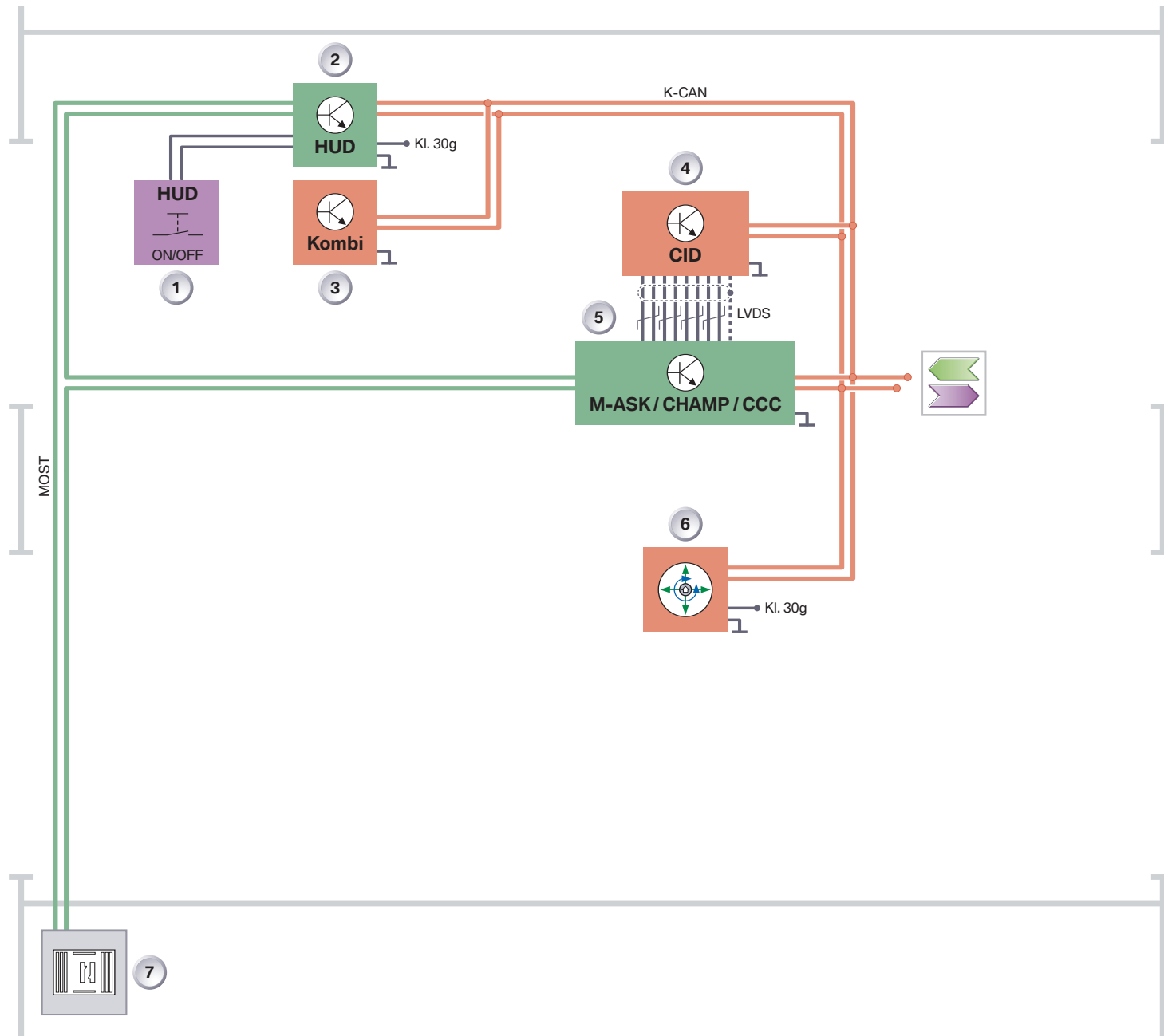
The upper area shows navigation information and CC messages in the form of symbols, bar display and text.

The lower area shows speed-related displays in the form of unit, current speed and cruise control.



Index	Explanation	Index	Explanation
1	LED array	5	Windshield
2	TFT projection display	6	Observer's point of vision
3	Plane mirror	7	Projected image
4	Curved mirror		

Heads- up Display System Schematic Circuit Diagram



Heads- up Display System Schematic Circuit Diagram Legend

Index	Explanation	Index	Explanation
1	Light switch center	7	MOST station
2	Head-up display HUD	K-CAN	Body CAN
3	Instrument cluster	MOST-Bus	Media Oriented System Transport bus
4	Central Information Display CID	LVDS	Low Voltage Differential Signalling
5	Multi-audio system controller Central Head unit And Multimedia Platform CHAMP Car Communication Computer CCC	KL 30g	Terminal 30g
6	Controller		

K-CAN and MOST Signals to the HUD Control Module

In/out	Information	Source/sink	Function
In	Road speed	Instrument cluster	Display in the HUD
In	Check control message	Instrument cluster	Display in the HUD
In	Dimming/brightness	Rain and driving light sensor(RLS) via roof function center (FZD)	Brightness adjustment
In	Height adjustment	CHAMP, CCC	Height adjustment
In	Brightness offset	CHAMP, CCC	Brightness adjustment
In	DCC	EHB3	Display in the HUD
In	Function selection	CHAMP, CCC	What is displayed in the HUD
In	On/Off switch	Light switch center (LZ)	Switching the HUD On/Off
In	Navigation	CHAMP, CCC	Display in the HUD

Mirrors

Unlike the previous system two mirrors, instead of four, are fitted in the head-up display to reflect the information onto the windshield surface.



The convex mirror (1) is responsible for compensating the image on the windshield and for the size and distance of the image.

The flat mirror (2) is a deflecting mirror to keep the beam in the space provided. The convex mirror is made of plastic while the flat mirror is made of glass.

Adjusting the Brightness

The brightness of the HUD can be individually adjusted via the CID. The brightness is adjusted as follows:

- Call up the main menu by pressing the menu button
- Press the Controller and select the "Settings" menu item
- Turn the Controller until "Displays/Screen" is highlighted in the menu bar and then confirm by pressing the Controller; the upper menu bar is activated

- Turn the Controller until "Head-up display brightness" is highlighted in the upper bar and then confirm
- Set the desired brightness by turning the Controller and confirm by pressing.



Adjusting the Height of the Horizon

To adjust the location of the image and the Eye box, the iDrive controller is used to move a stepper motor.

The Eye box can be shifted up to a maximum of ± 30 mm upwards or downward. The height setting is adjusted as follows:

- Call up the main menu by pressing the menu button
- Press the Controller and select the "Settings" menu item
- Turn the Controller until "Displays/Screen" is highlighted in the menu bar and then confirm by pressing the Controller; the upper menu bar is activated
- Turn the Controller until "Position" is highlighted in the upper bar and then confirm
- Set the desired height by turning the Controller and confirm by pressing.



Vertical Rotation of the HUD

The HUD image can be rotated in the horizontal by a service technician using the DIS (vertical rotation), after a replacing a windshield, for instance.

Note: The vertical rotation is adjusted via a stepper motor in steps of 0.25° from -3° to +3° with the DIS. Detailed information may be found in the BMW diagnostic system.

Image Defects

Incorrect installation of the HUD or of the windshield may result in faulty HUD projections. Some faults which may occur when the HUD or the windshield are fitted are shown in the next page.

Note: The HUD incorporates operating-hours counters for both the HUD and the LED array. When the HUD is replaced, the operating hours counter must be initialized to 0.

Correcting Distortion (warping)

Should the image be distorted after a change of windshield, the image display can be improved using the Warping function. Warping is the technical term for the improvement of the image display.



Image 1 is compressed widthways. Image 2 is displayed twice. Images 3 and 4 are distorted.

Note: Unlike the previous system, no special tools are needed to adjust the head-up display. Vertical (rotation) and distortion (warping) are corrected with the BMW diagnostic system.



Workshop Exercise - Head-Up Display

Adjust the Head-Up Display

What information can be displayed in the HUD? _____

Which display settings can be changed via iDrive? _____

Which display settings can be changed via the BMW Diagnosis System? _____

How are the adjustments carried out by the HUD unit?

Vertical _____

Rotational _____

Keystone/Trapezoidal _____